CRR option price with respect to the volatility, rather than an approximation from "tweaking", so the implied volatility optimization algorithm has more exact inputs and thus converges faster.

The "node vega" is calculated according to the expression in Equation (5) (assuming that no early exercise occurs at the node) of Figure 1,

$$V_i = \left(\frac{1}{R}\right) \times \left[p\, V^{UP}_{i+1} + (1-p)\, V^{DOWN}_{i+1} + \left(C^{UP}_{i+1} - C^{DOWN}_{i+1}\right)\frac{\partial p}{\partial \sigma} \right]$$

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where $\partial p/\partial \sigma$ is computed from the definition of risk neutral probability "p", where C^{up}_{i+1} is the "up" node option price at the end of the subperiod, C^{down}_{i+1} is the "down" node option price at the end of the subperiod, V^{up}_{i+1} and V^{down}_{i+1} are the up and down vegas at the end of the subperiod, and p is the "risk neutral probability". If early exercise occurs at the node, the vega at the node is given by Equation (6), $Vi = \partial Si/\partial \sigma$ where S is the stock price at the node, where the stock price assigned to a particular node is indirectly a function of the volatility. This approach allows the vega to be calculated at the same time that the option price is calculated.

If desired, the implied volatility can be computed using this method for both puts and calls across a range of different strike prices. Experience has shown that the implied volatility commonly varies across this range. Likewise, the present method can be used to plot the "volatility smile" (a graph of the implied volatility against the strike price), and can also be used as an improved method to determined the presence of a "volatility skew" (a difference between the implied volatilities using equal out of the money calls and puts). Some options trading is based on interpretation of such skew, and can be conducted more effectively using the method of the present invention. For example, high skew ratios can indicate that demand is increasing for puts, and so forth. In accordance with the invention, the computing device and associated software can provide data on the volatility smile, the volatility skew, and likewise with any other desired tool for analysis used by those in the art of options trading.